

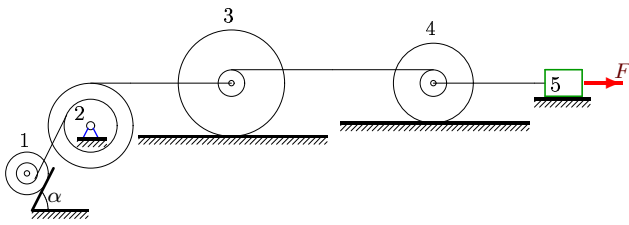
Кинетическая энергия системы. Приведенные массы

Механическая система, состоящая из пяти тел 1, 2, 3, 4 и 5, движется под действием внешних сил. Заданы радиусы цилиндров и блоков. Радиусы инерции ρ даны для блоков, цилиндры считать однородными. Горизонтальный стержень, находящийся в зацеплении с блоками, считать невесомым. Массы даны в килограммах, радиусы — в сантиметрах. Вычислить приведенную массу системы μ в формуле $T = \mu v_1^2/2$, где v_1 — скорость груза 1 (или центра цилиндра 1).

Кирсанов М.Н. Задачи по теоретической механике с решениями в **Maple 11**. — М.: ФИЗМАТЛИТ, 2010. — 264 с. (с.111)

Задача D-33.1.

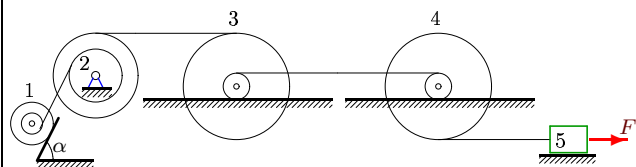
122



$$\begin{aligned} R_1 &= 2, r_1 = 1, \rho_1 = 1, \\ R_2 &= 4, r_2 = 2, \rho_2 = 3, \\ R_3 &= 4, r_3 = 1, \rho_3 = 3, \\ R_4 &= 3, r_4 = 1, \rho_4 = 2, \\ m_1 &= 20, m_2 = 80, \\ m_3 &= 128, m_4 = 256, \\ m_5 &= 256. \end{aligned}$$

Задача D-33.2.

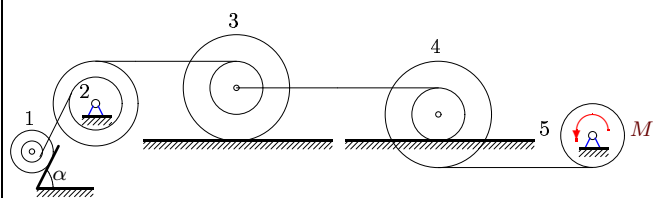
122



$$\begin{aligned}
 R_1 &= 2, \quad r_1 = 1, \quad \rho_1 = 1, \\
 R_2 &= 4, \quad r_2 = 2, \quad \rho_2 = 2, \\
 R_3 &= 4, \quad r_3 = 1, \quad \rho_3 = 3, \\
 R_4 &= 4, \quad r_4 = 1, \quad \rho_4 = 3, \\
 m_1 &= 4, \quad m_2 = 64, \\
 m_3 &= 20, \quad m_4 = 15, \\
 m_5 &= 50.
 \end{aligned}$$

Задача D-33.3.

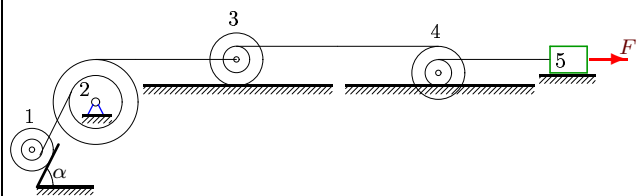
122



$$\begin{aligned}
 R_1 &= 2, \quad r_1 = 1, \quad \rho_1 = 1, \\
 R_2 &= 4, \quad r_2 = 2, \quad \rho_2 = 2, \\
 R_3 &= 4, \quad r_3 = 2, \quad \rho_3 = 3, \\
 R_4 &= 4, \quad r_4 = 2, \quad \rho_4 = 3, \\
 m_1 &= 4, \quad m_2 = 32, \\
 m_3 &= 144, \quad m_4 = 108, \\
 m_5 &= 36.
 \end{aligned}$$

Задача D-33.4.

122



$$R_1 = 2, r_1 = 1, \rho_1 = 2,$$

$$R_2 = 4, r_2 = 2, \rho_2 = 2,$$

$$R_3 = 2, r_3 = 1, \rho_3 = 1,$$

$$R_4 = 2, r_4 = 1, \rho_4 = 1,$$

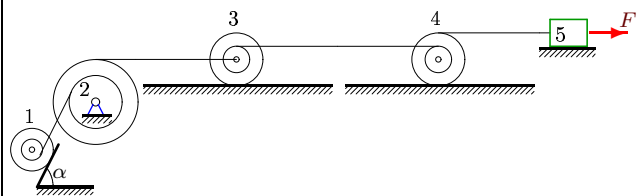
$$m_1 = 4, m_2 = 16,$$

$$m_3 = 16, m_4 = 6,$$

$$m_5 = 2.$$

Задача D-33.5.

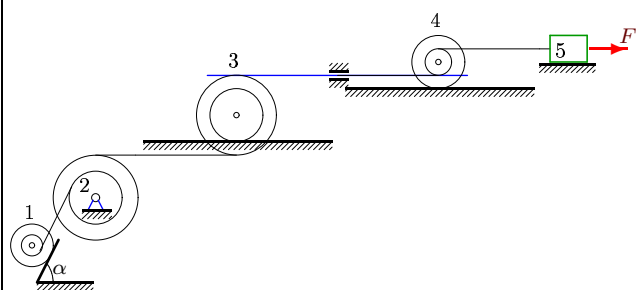
122



$$\begin{aligned}
 R_1 &= 2, \quad r_1 = 1, \quad \rho_1 = 2, \\
 R_2 &= 4, \quad r_2 = 2, \quad \rho_2 = 3, \\
 R_3 &= 2, \quad r_3 = 1, \quad \rho_3 = 1, \\
 R_4 &= 2, \quad r_4 = 1, \quad \rho_4 = 1, \\
 m_1 &= 12, \quad m_2 = 16, \\
 m_3 &= 24, \quad m_4 = 20, \\
 m_5 &= 4.
 \end{aligned}$$

Задача D-33.6.

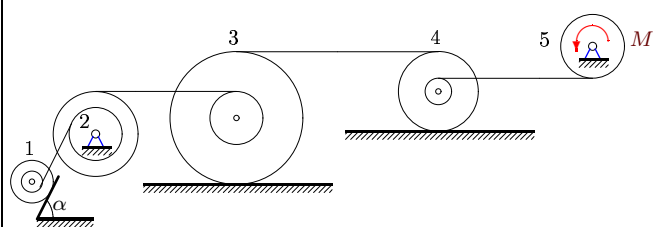
122



$$\begin{aligned}
 R_1 &= 2, \quad r_1 = 1, \quad \rho_1 = 2, \\
 R_2 &= 4, \quad r_2 = 2, \quad \rho_2 = 3, \\
 R_3 &= 3, \quad r_3 = 2, \quad \rho_3 = 2, \\
 R_4 &= 2, \quad r_4 = 1, \quad \rho_4 = 1, \\
 m_1 &= 4, \quad m_2 = 16, \\
 m_3 &= 4, \quad m_4 = 1, \\
 m_5 &= 1.
 \end{aligned}$$

Задача D-33.7.

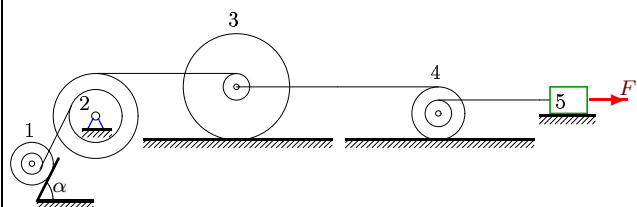
122



$$\begin{aligned}
 R_1 &= 2, \quad r_1 = 1, \quad \rho_1 = 1, \\
 R_2 &= 4, \quad r_2 = 2, \quad \rho_2 = 3, \\
 R_3 &= 5, \quad r_3 = 2, \quad \rho_3 = 4, \\
 R_4 &= 3, \quad r_4 = 1, \quad \rho_4 = 2, \\
 m_1 &= 4, \quad m_2 = 80, \\
 m_3 &= 196, \quad m_4 = 441, \\
 m_5 &= 882.
 \end{aligned}$$

Задача D-33.8.

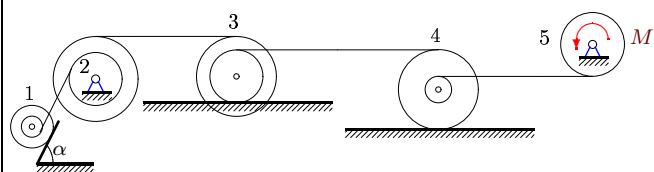
122



$$\begin{aligned}
 R_1 &= 2, \quad r_1 = 1, \quad \rho_1 = 1, \\
 R_2 &= 4, \quad r_2 = 2, \quad \rho_2 = 3, \\
 R_3 &= 4, \quad r_3 = 1, \quad \rho_3 = 3, \\
 R_4 &= 2, \quad r_4 = 1, \quad \rho_4 = 1, \\
 m_1 &= 4, \quad m_2 = 16, \\
 m_3 &= 4, \quad m_4 = 15, \\
 m_5 &= 50.
 \end{aligned}$$

Задача D-33.9.

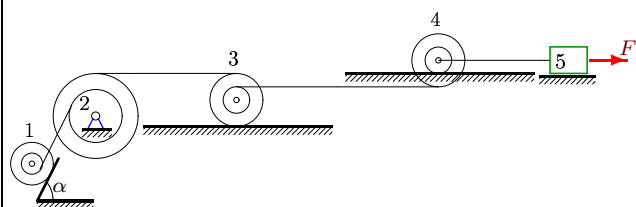
122



$$\begin{aligned}
 R_1 &= 2, \quad r_1 = 1, \quad \rho_1 = 2, \\
 R_2 &= 4, \quad r_2 = 2, \quad \rho_2 = 3, \\
 R_3 &= 3, \quad r_3 = 2, \quad \rho_3 = 2, \\
 R_4 &= 3, \quad r_4 = 1, \quad \rho_4 = 2, \\
 m_1 &= 16, \quad m_2 = 80, \\
 m_3 &= 175, \quad m_4 = 225, \\
 m_5 &= 450.
 \end{aligned}$$

Задача D-33.10.

122



$$R_1 = 2, r_1 = 1, \rho_1 = 2,$$

$$R_2 = 4, r_2 = 2, \rho_2 = 2,$$

$$R_3 = 2, r_3 = 1, \rho_3 = 1,$$

$$R_4 = 2, r_4 = 1, \rho_4 = 1,$$

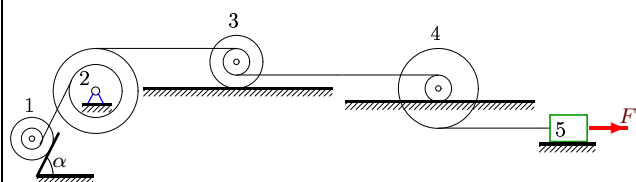
$$m_1 = 4, m_2 = 96,$$

$$m_3 = 64, m_4 = 24,$$

$$m_5 = 32.$$

Задача D-33.11.

122



$$R_1 = 2, r_1 = 1, \rho_1 = 2,$$

$$R_2 = 4, r_2 = 2, \rho_2 = 2,$$

$$R_3 = 2, r_3 = 1, \rho_3 = 1,$$

$$R_4 = 3, r_4 = 1, \rho_4 = 2,$$

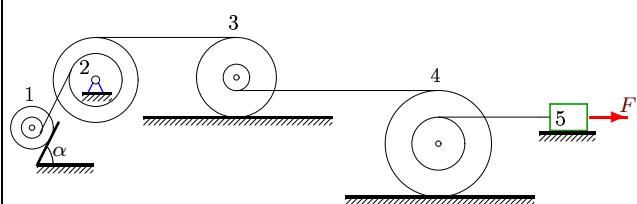
$$m_1 = 4, m_2 = 32,$$

$$m_3 = 36, m_4 = 108,$$

$$m_5 = 18.$$

Задача D-33.12.

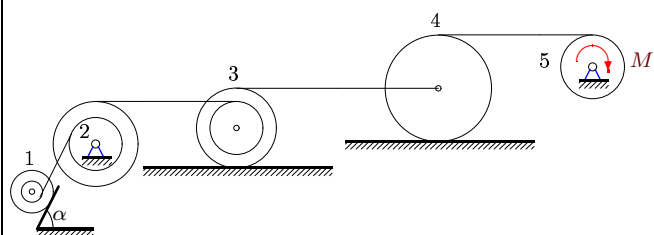
122



$$\begin{aligned}
 R_1 &= 2, \quad r_1 = 1, \quad \rho_1 = 1, \\
 R_2 &= 4, \quad r_2 = 2, \quad \rho_2 = 3, \\
 R_3 &= 3, \quad r_3 = 1, \quad \rho_3 = 2, \\
 R_4 &= 4, \quad r_4 = 2, \quad \rho_4 = 3, \\
 m_1 &= 20, \quad m_2 = 32, \\
 m_3 &= 288, \quad m_4 = 576, \\
 m_5 &= 96.
 \end{aligned}$$

Задача D-33.13.

122



$$R_1 = 2, r_1 = 1, \rho_1 = 2,$$

$$R_2 = 4, r_2 = 2, \rho_2 = 3,$$

$$R_3 = 3, r_3 = 2, \rho_3 = 2,$$

$$R_4 = 4,$$

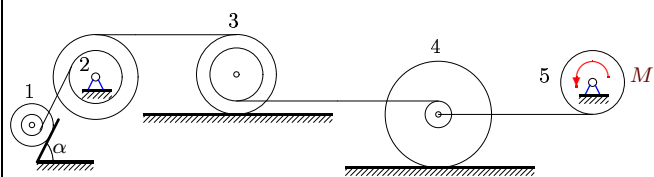
$$m_1 = 4, m_2 = 48,$$

$$m_3 = 100, m_4 = 75,$$

$$m_5 = 50.$$

Задача D-33.14.

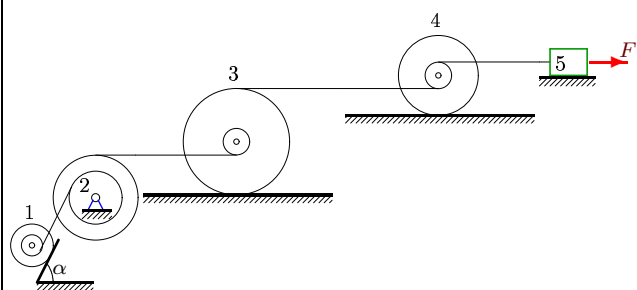
122



$$\begin{aligned}
 R_1 &= 2, \quad r_1 = 1, \quad \rho_1 = 2, \\
 R_2 &= 4, \quad r_2 = 2, \quad \rho_2 = 3, \\
 R_3 &= 3, \quad r_3 = 2, \quad \rho_3 = 2, \\
 R_4 &= 4, \quad r_4 = 1, \quad \rho_4 = 3, \\
 m_1 &= 8, \quad m_2 = 48, \\
 m_3 &= 180, \quad m_4 = 144, \\
 m_5 &= 450.
 \end{aligned}$$

Задача D-33.15.

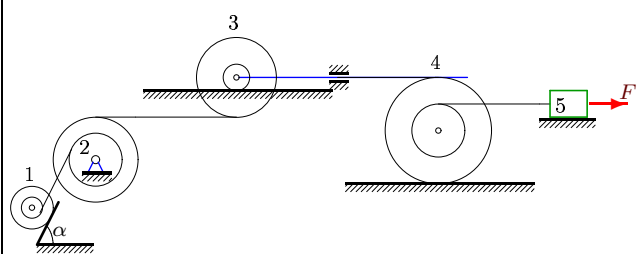
122



$$\begin{aligned} R_1 &= 2, r_1 = 1, \rho_1 = 1, \\ R_2 &= 4, r_2 = 2, \rho_2 = 3, \\ R_3 &= 4, r_3 = 1, \rho_3 = 3, \\ R_4 &= 3, r_4 = 1, \rho_4 = 2, \\ m_1 &= 4, m_2 = 32, \\ m_3 &= 36, m_4 = 9, \\ m_5 &= 9. \end{aligned}$$

Задача D-33.16.

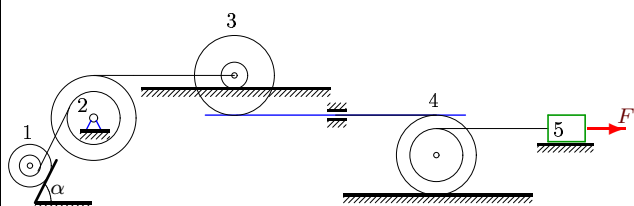
122



$$\begin{aligned}
 R_1 &= 2, r_1 = 1, \rho_1 = 1, \\
 R_2 &= 4, r_2 = 2, \rho_2 = 3, \\
 R_3 &= 3, r_3 = 1, \rho_3 = 2, \\
 R_4 &= 4, r_4 = 2, \rho_4 = 3, \\
 m_1 &= 4, m_2 = 80, \\
 m_3 &= 16, m_4 = 256, \\
 m_5 &= 128.
 \end{aligned}$$

Задача D-33.17.

122



$$R_1 = 2, r_1 = 1, \rho_1 = 1,$$

$$R_2 = 4, r_2 = 2, \rho_2 = 3,$$

$$R_3 = 3, r_3 = 1, \rho_3 = 2,$$

$$R_4 = 3, r_4 = 2, \rho_4 = 2,$$

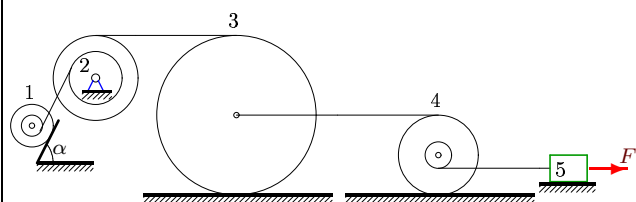
$$m_1 = 20, m_2 = 16,$$

$$m_3 = 8, m_4 = 63,$$

$$m_5 = 54.$$

Задача D-33.18.

122



$$R_1 = 2, r_1 = 1, \rho_1 = 1,$$

$$R_2 = 4, r_2 = 2, \rho_2 = 3,$$

$$R_3 = 6,$$

$$R_4 = 3, r_4 = 1, \rho_4 = 2,$$

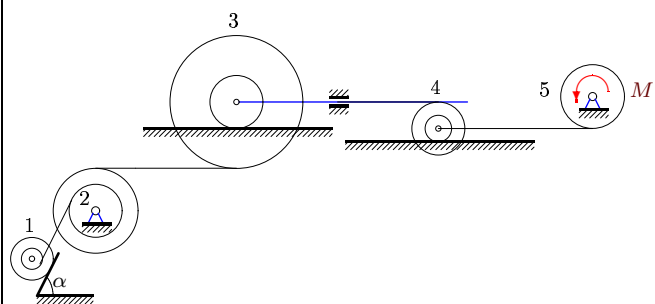
$$m_1 = 4, m_2 = 32,$$

$$m_3 = 32, m_4 = 144,$$

$$m_5 = 72.$$

Задача D-33.19.

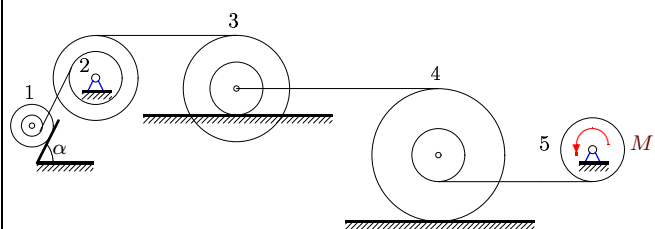
122



$$\begin{aligned}
 R_1 &= 2, r_1 = 1, \rho_1 = 1, \\
 R_2 &= 4, r_2 = 2, \rho_2 = 2, \\
 R_3 &= 5, r_3 = 2, \rho_3 = 4, \\
 R_4 &= 2, r_4 = 1, \rho_4 = 1, \\
 m_1 &= 4, m_2 = 16, \\
 m_3 &= 36, m_4 = 243, \\
 m_5 &= 162.
 \end{aligned}$$

Задача D-33.20.

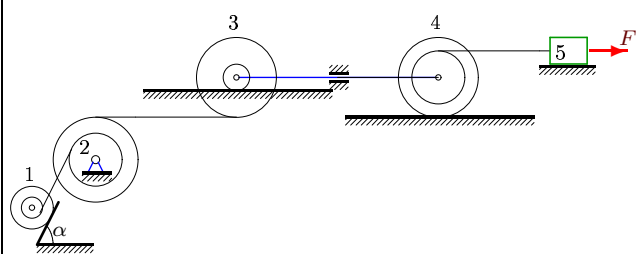
122



$$\begin{aligned}
 R_1 &= 2, r_1 = 1, \rho_1 = 1, \\
 R_2 &= 4, r_2 = 2, \rho_2 = 3, \\
 R_3 &= 4, r_3 = 2, \rho_3 = 3, \\
 R_4 &= 5, r_4 = 2, \rho_4 = 4, \\
 m_1 &= 4, m_2 = 48, \\
 m_3 &= 144, m_4 = 900, \\
 m_5 &= 200.
 \end{aligned}$$

Задача D-33.21.

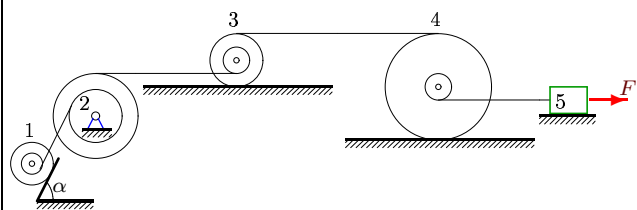
122



$$\begin{aligned}
 R_1 &= 2, r_1 = 1, \rho_1 = 1, \\
 R_2 &= 4, r_2 = 2, \rho_2 = 3, \\
 R_3 &= 3, r_3 = 1, \rho_3 = 2, \\
 R_4 &= 3, r_4 = 2, \rho_4 = 2, \\
 m_1 &= 12, m_2 = 96, \\
 m_3 &= 24, m_4 = 180, \\
 m_5 &= 144.
 \end{aligned}$$

Задача D-33.22.

122



$$R_1 = 2, r_1 = 1, \rho_1 = 2,$$

$$R_2 = 4, r_2 = 2, \rho_2 = 3,$$

$$R_3 = 2, r_3 = 1, \rho_3 = 1,$$

$$R_4 = 4, r_4 = 1, \rho_4 = 3,$$

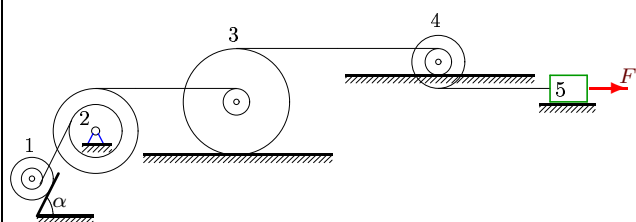
$$m_1 = 20, m_2 = 48,$$

$$m_3 = 8, m_4 = 28,$$

$$m_5 = 24.$$

Задача D-33.23.

122



$$R_1 = 2, r_1 = 1, \rho_1 = 1,$$

$$R_2 = 4, r_2 = 2, \rho_2 = 2,$$

$$R_3 = 4, r_3 = 1, \rho_3 = 3,$$

$$R_4 = 2, r_4 = 1, \rho_4 = 1,$$

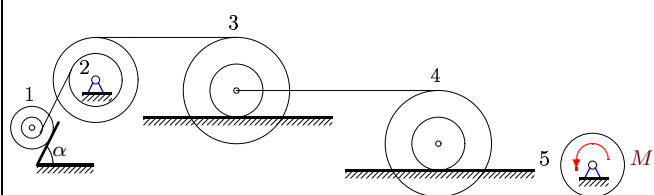
$$m_1 = 4, m_2 = 16,$$

$$m_3 = 4, m_4 = 75,$$

$$m_5 = 50.$$

Задача D-33.24.

122



$$R_1 = 2, r_1 = 1, \rho_1 = 1,$$

$$R_2 = 4, r_2 = 2, \rho_2 = 2,$$

$$R_3 = 4, r_3 = 2, \rho_3 = 3,$$

$$R_4 = 4, r_4 = 2, \rho_4 = 3,$$

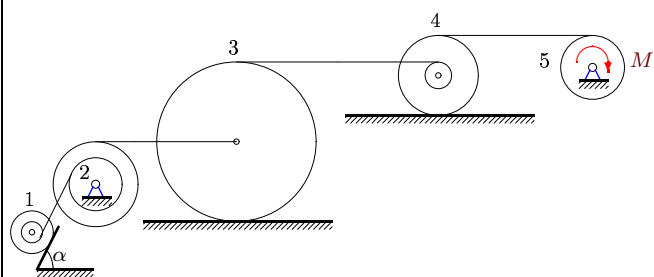
$$m_1 = 4, m_2 = 80,$$

$$m_3 = 144, m_4 = 324,$$

$$m_5 = 162.$$

Задача D-33.25.

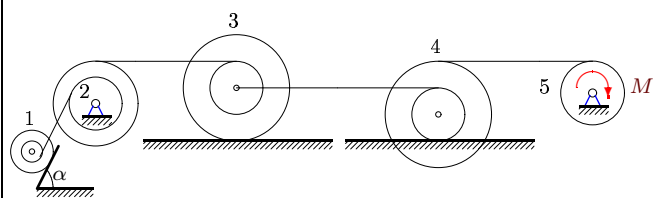
122



$$\begin{aligned}
 R_1 &= 2, \quad r_1 = 1, \quad \rho_1 = 1, \\
 R_2 &= 4, \quad r_2 = 2, \quad \rho_2 = 3, \\
 R_3 &= 6, \\
 R_4 &= 3, \quad r_4 = 1, \quad \rho_4 = 2, \\
 m_1 &= 16, \quad m_2 = 32, \\
 m_3 &= 14, \quad m_4 = 24, \\
 m_5 &= 10.
 \end{aligned}$$

Задача D-33.26.

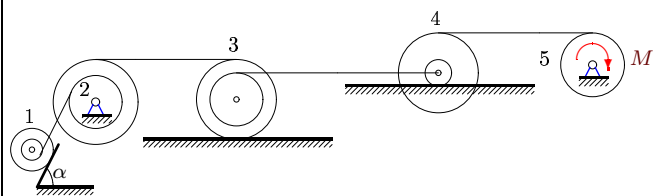
122



$$\begin{aligned}
 R_1 &= 2, \quad r_1 = 1, \quad \rho_1 = 1, \\
 R_2 &= 4, \quad r_2 = 2, \quad \rho_2 = 2, \\
 R_3 &= 4, \quad r_3 = 2, \quad \rho_3 = 3, \\
 R_4 &= 4, \quad r_4 = 2, \quad \rho_4 = 3, \\
 m_1 &= 4, \quad m_2 = 80, \\
 m_3 &= 144, \quad m_4 = 108, \\
 m_5 &= 4.
 \end{aligned}$$

Задача D-33.27.

122



$$R_1 = 2, r_1 = 1, \rho_1 = 2,$$

$$R_2 = 4, r_2 = 2, \rho_2 = 2,$$

$$R_3 = 3, r_3 = 2, \rho_3 = 2,$$

$$R_4 = 3, r_4 = 1, \rho_4 = 2,$$

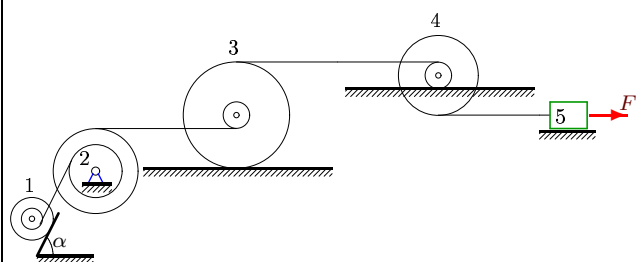
$$m_1 = 4, m_2 = 32,$$

$$m_3 = 144, m_4 = 36,$$

$$m_5 = 36.$$

Задача D-33.28.

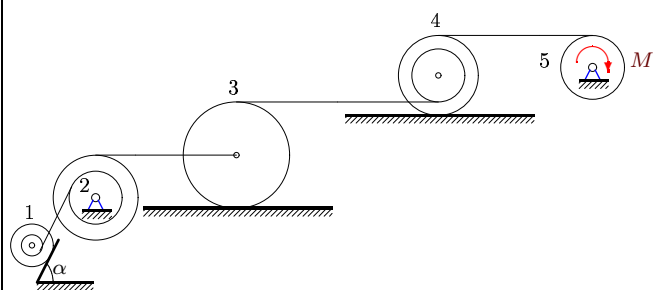
122



$$\begin{aligned}
 R_1 &= 2, r_1 = 1, \rho_1 = 1, \\
 R_2 &= 4, r_2 = 2, \rho_2 = 2, \\
 R_3 &= 4, r_3 = 1, \rho_3 = 3, \\
 R_4 &= 3, r_4 = 1, \rho_4 = 2, \\
 m_1 &= 4, m_2 = 32, \\
 m_3 &= 36, m_4 = 27, \\
 m_5 &= 18.
 \end{aligned}$$

Задача D-33.29.

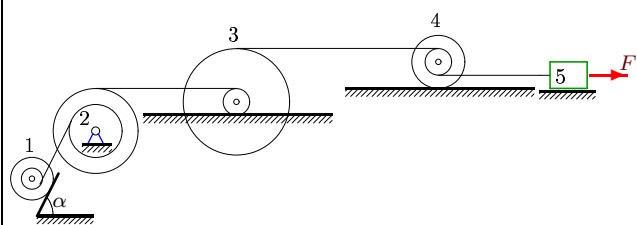
122



$$\begin{aligned}
 R_1 &= 2, \quad r_1 = 1, \quad \rho_1 = 1, \\
 R_2 &= 4, \quad r_2 = 2, \quad \rho_2 = 3, \\
 R_3 &= 4, \\
 R_4 &= 3, \quad r_4 = 2, \quad \rho_4 = 2, \\
 m_1 &= 4, \quad m_2 = 16, \\
 m_3 &= 8, \quad m_4 = 3, \\
 m_5 &= 2.
 \end{aligned}$$

Задача D-33.30.

122



$$\begin{aligned}
 R_1 &= 2, \quad r_1 = 1, \quad \rho_1 = 1, \\
 R_2 &= 4, \quad r_2 = 2, \quad \rho_2 = 3, \\
 R_3 &= 4, \quad r_3 = 1, \quad \rho_3 = 3, \\
 R_4 &= 2, \quad r_4 = 1, \quad \rho_4 = 1, \\
 m_1 &= 20, \quad m_2 = 16, \\
 m_3 &= 16, \quad m_4 = 36, \\
 m_5 &= 216.
 \end{aligned}$$

Ответы.**Кинетическая энергия системы. Приведенные массы**08.05.2014

№	μ_1	μ_2	μ_3	μ_4	μ_5	$Sum\mu_k$
1	25	45	200	325	225	820
2	5	16	8	6	18	53
3	5	8	100	39	2	154
4	8	4	20	3	2	37
5	24	9	30	25	16	104
6	8	9	32	125	225	399
7	5	45	164	325	400	939
8	5	9	4	3	18	39
9	32	45	56	52	64	249
10	8	24	20	27	18	97
11	8	8	20	15	2	53
12	25	18	104	25	6	178
13	8	27	52	162	144	393
14	16	27	65	4	4	116
15	5	18	100	208	256	587
16	5	45	20	25	18	113
17	25	9	40	91	150	315
18	5	18	12	13	2	50
19	5	4	80	24	4	117
20	5	27	52	41	1	126
21	15	54	30	65	100	264
22	40	27	40	175	54	336
23	5	4	4	96	32	141
24	5	20	52	13	1	91
25	20	18	21	78	45	182
26	5	20	100	39	2	166
27	8	8	52	125	200	393
28	5	8	100	240	128	481
29	5	9	12	156	144	326
30	25	9	40	125	150	349